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10/017,148	12/14/2001	Ralph E. Jennings JR.	SNS-009B	9301

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EXAMINER

NGUYEN, KIMBINH T

ART UNIT	PAPER NUMBER
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2671

DATE MAILED: 12/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/017,148

Applicant(s)

JENNINGS ET AL.

Examiner

Kimbinh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 December 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-56 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-56 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2,4,5.
- ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

1. Claims 1-56 are pending in the application.

#### *Drawings*

2. The drawings were received on 3/3/02. These drawings are accepted.

#### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-9, 12-21, 24-36, 39-48, 53-56 are rejected under 35 U.S.C. 102(e) as being anticipated by Shih et al. (6,552,722).

**Claim 1**, Shih et al. clearly anticipated representing a virtual object as a volumetric model (virtual object 26 is a volumetric representation; col. 2, lines 48-49; col. 3, lines 32-33; fig. 2A); converting a subset of the volumetric model (a portion of the volumetric model) into an alternative representation (exporting and/or importing surface or polygonal representation; col. 2, line 66 through col. 3, line 6); determining a response of the alternative representation to a stimulus (haptic virtual environment,

haptic interface); modifying the volumetric representation to represent the response of the alternative representation to the stimulus (col. 3, lines 11-25).

**Claim 2**, Shih et al. discloses determining a response of the alternative representation to a first stimulus (modifying the surface of the object or haptic feedback) and further to a second succeeding stimulus (the user may rely on haptic feedback (virtual tool) to produce a model; col. 2, lines 12-27).

**Claim 3**, Shih discloses a change in shape of the volumetric representation (col. 11, lines 38-55).

**Claim 4**, Shih discloses converting the response of the alternative representation (surface representation) to the stimulus into a response of the volumetric representation to the stimulus (modifying the object; col. 2, line 66 through col. 3, line 6).

**Claims 5-8**, Shih discloses the subset of the volumetric model is a portion of the volumetric model; the volumetric model comprises voxels (col. 18, lines 47-53); values spaced in a 3D grid (col. 18, lines 3-4).

**Claims 9, 13**, Shih discloses the alternative representation comprises a surface (col. 3, line 44); an alternative voxel (col. 17, lines 6-10).

**Claim 12**, Shih teaches the alternative representation comprises a selected one of a polygon set (polygonal surface; col. 3, line 44), a bezier surface, a b-spline surface (col. 3, lines 49-50), a procedural surface, a NURBS (col. 20, lines 59-60).

**Claims 14-16**, Shih teaches the stimulus is a stimulus from a user using a haptic interface which is a feedback interface has three degrees of force feedback (col. 10, lines 48-60).

**Claim 17**, Shih teaches displaying the virtual object on a computer display (col. 3, lines 24-25; col. 7, lines 11-14; col. 41, line 51; fig. 18, # 418).

**Claim 18**, Shih discloses the volumetric and alternative representations comprise representations having different numbers of dimensions (col. 36, line 62 through col. 37, line 4).

**Claims 19, 20**, Shih discloses the applied stimulus comprises at least one of a displacement function (penetration distance; col. 19, lines 15-17; col. 26, lines 1-10), a smoothing function (col. 34, line 60; col. 36, lines 36-58), a volumetric interference, an areal interference (a collision between a virtual tool and a virtual object; col. 20, lines 53-58), a result of simulation (col. 33, lines 33-39), a control point modification (col. 29, lines 60-62; col. 31, lines 50-56), a data re-fitting, and a force (col. 29, lines 63-67; col. 30, lines 7-24); the applied stimulus is applied to the object in real-time (moving in a continuous motion; col. 31, lines 45-46).

**Claim 21**, Shih discloses transforming the alternative representation (virtual surface for the voxel-based virtual object) into a third representation (virtual tool); modifying the third representation in response to an applied stimulus (the user may rely on haptic feedback when modifying the object; col. 2, lines 12-20); transforming (applying interaction force (penetration) among the constraint geometry) the modified third representation (virtual tool) to a modified volumetric representation (the voxel-based virtual object), col. 41, lines 41-50.

**Claim 24**, Shih discloses applying a feedback force to a user, the feedback force being generally consistent with a geometric shape of a modified virtual object (col. 38, lines 10-40).

**Claim 25**, the rationale provide in the rejection of claims 1 and 6 is incorporated herein.

**Claims 26, 55**, the rationale provided in the rejection of claim 19 is incorporated herein.

**Claims 27, 56**, the rationale provided in the rejection of claims 9 and 25 is incorporated herein.

**Claims 28-36, 39-48, 53 and 54** disclose a system having claimed elements the same as claims 1-9, 12-21, 24, 25 and are rejected under the same reasons set forth in claims 1-9, 12-21, 24, 25.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 10, 11, 22, 23, 37, 38 and 49-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shih et al. (6,552,722) in view of Tarr (6,191,796).

**Claims 10, 37**, Tarr (6,191,796) teaches the alternative representation comprises a set of triangles representation (fig. 13A). **Claims 11, 38, 52**, the stimulus

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comprises a weighted displacement function (penetrating vertex: the magnitude of the distance) defined on vertices of the set of triangles (vertices of the triangular mesh forming the virtual surface; col. 15, lines 10-64; col. 32, lines 43-67). **Claims 22, 49**, generating an intermediate modified representation (a virtual deformable surface representation; col. 36, lines 21-24). **Claim 23**, a user motion in 3D space (col. 7, lines 57-63). **Claims 50 and 51**, at least two of the first, second and third modification, transformation modules are the same module (col. 6, lines 26-45). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the triangular representation as taught by Tarr into the sculpting virtual object in a haptic virtual reality environment of Shih's system for modifying the virtual object, because it would provide a method for haptically deforming a virtual surface within a haptic virtual environment which would be represented by a mesh of polygon such as triangles (col. 2, lines 1-8).

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Kimbinh Nguyen** whose telephone number is **(703) 305-9683**. The examiner can normally be reached **(Monday- Thursday from 7:00 AM to 4:30 PM and alternate Fridays from 7:00 AM to 3:30 PM)**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

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Washington, D.C. 20231

**Or faxed to:**


**(703) 872-9314 (for Technology Center 2600 only)**

Hand-delivered responses should be brought to Crystal Part II, 2121 Crystal Drive,  
Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or  
proceeding should be directed to the Technology Center 2600 Customer Service Office  
whose telephone number is (703) 306-0377.

Kimbinh Nguyen

December 10, 2003

  
MARK ZIMMERMAN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2600